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# APPENDIX B

# DRAFT FIELD SAMPLING PLAN FOR THE INTERIM REMEDIAL ACTION AT THE HURLEY SOILS INVESTIGATION UNIT

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# 1.0 INTRODUCTION

This Field Sampling Plan (FSP) provides details about the sampling and analytical requirements for the Interim Remedial Action (IRA) in the Hurley Soils Investigation Unit (HSIU). Sampling and analyses conducted as part of the IRA will be done in accordance with the Administrative Order on Consent (AOC) between Chino Mines Company (Chino) and the New Mexico Environment Department (NMED).

This FSP has been prepared to guide the collection and analysis of soil samples for the presence of copper. Copper was deposited onto properties via historic aerial dispersion of fugitive dust and smelter emissions from the Hurley smelter facility. There are four sampling and analysis activities:

- Borrow Source Sampling;
- Yard Area Soil Sampling;
- Discrete Area Sampling; and
- Confirmation Soil Sampling.

Surficial soil in residential properties that exceeds the action level will require remedial action by removal (excavation). If soil remaining after excavation continues to exceed the action level, as defined in Section 3.4, then further removal action will be performed.

The purpose of this FSP is to establish the tasks and methodology by which data collection and analytical activities will be conducted for the IRA. The sampling activities presented in the following sections will be conducted in accordance with the AOC Quality Assurance Project Plan (QAPP) and AOC Health and Safety Plan (HSP), incorporated by reference. The analytical methodologies and contract required detection limits (CRDLs) established for this investigation are provided in the QAPP, unless specified otherwise.

## 2.0 SAMPLE COLLECTION

Soil samples will be collected and analyzed for the presence of copper using a field-portable X-Ray Fluorescence (XRF) instrument. For quality assurance/quality control (QA/QC) in accordance with the QAPP, a subset of these samples (5%) will be split and submitted for laboratory analysis to determine the presence of copper using EPA Method 6010, ICP-AES. All soil samples will be collected as discrete ("grab") samples.

All soil samples, unless specified otherwise, will be collected from undisturbed areas in accordance with Section 3.0 "Field Sampling Procedures". Areas that have been recently or severely disturbed, such as areas of new construction or recent landscaping, will be avoided for sampling purposes. All sample locations are general and subject to change at the time of sampling based on accessibility or other conditions that may interfere with sample collection (e.g., pavement, buildings). Sample locations will be clearly marked on plot plans for each property (at a scale of approximately 1" = 20'), along with property landmarks for reference. Global Positioning System (GPS) or other survey location measurements will not be necessary, as the relative position of sample locations with reference to property landmarks can be determined by taping or similar methods with sufficient accuracy for use in the IRA.

All affected property owners will be contacted prior to sampling to request access to their property for sampling purposes. An "Access Agreement" form will be completed and signed by the property owner prior to sample collection. In the event that a property owner cannot be contacted or will not allow soil sampling on their property, the NMED will assume responsibility for determining the subsequent course of action.

Quality assurance/quality control samples will be collected in accordance with procedures in the QAPP.

Individual samples from each sampling location will be designated by a unique sample number in accordance with the AOC site-wide sample numbering scheme specified under Standard Operating Procedure (SOP) 1. Samples will be assigned numbers chronologically as they are collected, beginning with U05-5600.

Soil sampling will be conducted in accordance with the SOPs developed specific for AOC activities. Surface soil samples will be collected in accordance with SOP 22, "Surface Soil Sampling".

# 3.0 SAMPLING RATIONALE AND FIELD SAMPLING PROCEDURES

Field sampling will occur in four categories, (1) borrow source sampling, (2) yard area soil sampling, (3) discrete area sampling, and 4) confirmation sampling.

## 3.1 Borrow Source Sampling

Borrow source requirements are defined in the technical specifications. The actual borrow source locations will be identified by the Remediation Contractor (RC), and are subject to change based on availability and quality of the materials.

The objective of borrow source sampling and analysis is to characterize potential borrow soil materials that will used for restoration at the subject property (i.e., to replace contaminated soil that has been removed) to verify that they meet the physical characteristics identified in the technical specifications and do not contain contaminants above action levels.

A minimum of three discrete grab samples will be collected randomly from each borrow source area.

Samples will be shipped under chain of custody to an accredited laboratory for the analysis listed in Table 4-1 of the QAPP for soil/sediment samples.

## 3.2 Yard Area Soil Sampling

The results of the sampling and analyses conducted for the RI indicate that copper concentrations are relatively uniform over an area the size of one residential block due to the nature of airborne dispersion. Therefore, it is reasonable to assume that copper concentrations within a smaller area, such as a residential yard, would be relatively uniform except in the case where the soil in that yard has been disturbed. Consequently, any area of high copper concentrations within a property located within the IRA Project boundary is likely to be a large proportion of the property.

Yard area soil sampling will be conducted to satisfy two objectives:

1. To verify that soil concentrations in the property exceed the action level and remediation is warranted (in areas where soil copper concentrations are expected to be near the action level); and

2. To identify any soil areas within the property where copper concentrations are below the action level (such as areas with imported materials, and/or covered with vegetation), and therefore do not require remediation.

A grid sampling approach was developed to satisfy both objectives. Hold points have been identified for areas where there is relatively little uncertainty about exceedance of the action level, as described below.

A typical residential property in Hurley is about 11,200 square feet (sf). Subtracting a house footprint of about 1,200 sf leaves an outdoor yard area of about 10,000 sf. Therefore, for the purposes of yard area soil sampling, it is assumed that detecting hotspots, each with a circular area of at least 500 sf, or 5% of the yard area, with a 95% probability of detecting such a hotspot, will be sufficient to identify all soil removal areas in the yard.

A systematic grid sampling approach with a random start will be used to determine the number and location of samples in the yard of each residential property. The algorithm used to calculate the grid size, and hence the number of samples required to detect the minimum hotspot, is based on work by Singer (1972, 1975). Inputs to the algorithm include the size, shape, and orientation of the hot spot of interest, an acceptable probability of not finding a hot spot, and the desired type of sampling grid. The inputs to the algorithm and the results for this project are:

| **Parameter Inputs** | **Description** | **Value** |
|---|---|---|
| 1-β | Probability of detection | 95% |
| Grid Type | Grid pattern (Square, Triangle or Rectangle) | Square |
| Hot Spot Shape | Hot spot height to width ratio | 1 (circle) |
| Hot Spot Area | Area of hot spot (Length$^2$ * Shape * PI) | 500 ft$^2$ |
| Angle | Angle of orientation between hot spot and grid | Random |
| Sampling Area | Total area to sample | 10,000 ft$^2$ |
| **Outputs** | | |
| Grid Size | Length of side of grid | 21 ft |
| Samples | Optimum number of samples | 20 to 25 |

The results of the yard area sampling will be used to identify areas that will require remediation. If the results indicate that copper concentrations are greater than the action level, then the soil will be excavated. If the copper concentrations are less than the action level, then the soil will remain in place.

Samples will be collected in the locations where grid nodes occur. In the event that a grid node falls in an area that is permanently covered, either by a structure or pavement, the area will be considered effectively remediated, and a sample will not be collected. If a grid node falls in an area that is permanently covered but close to an open area, a sample will be collected near the grid node in the open area. Some field judgment will be used to determine a proximal open area. In general, if an open area lies within 10 feet of a "covered" node, it will be sampled.

In some cases, a property may have two (or more) relatively different types of yards. Typically in the town of Hurley, the front yard consists of a maintained lawn, and the back yard may be gravel or bare soil. In these cases, to be determined in the field, the property may be split into two separate areas, and the sampling plan described above will be applied independently to both areas.

If the property occurs within the IRA project area, i.e., where concentrations are estimated to be 10,000 mg/kg or greater (Figure 1-1 of the IRA Work Plan, (Golder 2005), it is reasonable to assume that copper concentrations in all undisturbed soil exceed the action level. Therefore, hold points have been established for these properties to prevent unnecessary over-analysis. The hold point for objective 1 is:

- **Hold Point 1.** Collect samples on a grid as specified above, analyze approximately 30% of the samples, selected randomly. If the results of the initial analysis indicate that copper concentrations are all above the action level, then proceed with remediation for that entire property. If the results indicate that some areas of the property are below the action level, then continue analysis of the remaining samples. This hold point is protective of human health, as the only shortcut is the decision to remediate the entire property based on minimal sampling.

### 3.3 Discrete Area Sampling

It is anticipated that there will be several areas within a property that may not require remediation, either because they contain imported soil materials, consist of a raised bed, or other conditions that result in an effective cover or eliminate the potential exposure to elevated copper. The objective of discrete area sampling is to characterize soil in such discrete landscape areas to determine whether copper concentrations exceed the action level.

Samples will be collected from these discrete areas based on judgment in the field. As a rule of thumb, about one sample per 1,000 sf in a given discrete area will be collected.

### 3.4 Confirmation Soil Sampling

The objective of confirmation sampling is to characterize copper concentrations in the soil remaining after excavation, to verify that the action level has been achieved. If the action level is achieved, the areas is ready for restoration, if not, further excavation will be performed.

After soil has excavated from a property, the excavated areas will be sampled at the same grid locations used in the yard sampling and discrete area sampling (see sections 3.2 and 3.3 above). Samples will be collected only from the areas that were excavated. Confirmation sampling will be conducted using the following hold points:

1. If the results are all below the action level, then the property will be released for restoration activities. If not, then further excavation will be directed in the areas where exceedances occur.

2. If further excavation is needed, confirmation sampling will be conducted as needed to monitor progress towards achieving the action level. Excavation will stop when the sampling results for remaining soil on the entire property pass the three-part test described below.

The three-part test is based on compliance monitoring requirements established by Washington State Model Toxics Control Act (WAC 173-340-740(7), as promulgated by the Washington Department of Ecology (WDOE). An example of the practical application of this test was at the ASARCO Everett Smelter Site in Everett, Washington (WDOE 1999). The three-part test must meet the following requirements:

1) No single sample concentrations is greater than two times the action level;

2) Less then 10% of the sample concentrations exceed the action level; and

3) The upper 95% confidence limit on the median is less than the action level.

Once all three conditions has been achieved, the CQAM will release the property for restoration activities. Excavation will continue until all three-part conditions are met, until a depth of one foot is reached, or until refusal (e.g., caliche).

### 3.5 Field Sampling Procedures

The procedures for soil sampling are as follows:

1. Visually observe the individual residential property for differences in front and back yard areas, the presence of discrete areas (imported materials, raised beds, etc.), and the presence of debris, junk, and other materials that would affect sample collection. Describe the property features in a field book or on a field sketch or plan.
2. Layout a measured grid on the property using approximately 20 foot squares as described in section 3.2. Record the grid node locations in the field book or on the field sketch or plan.
3. Collect a grab soil sample at each grid node from a depth of 0 (surface) to 3 inches below the surface. Carefully scrape the surface vegetation away at each sample location before sample collection. All grab samples will be scooped so as to sample the complete interval.
4. Soil samples from each designated location will be collected using a stainless steel spatula or trowel, and placed in the appropriate sample container.
5. All sample collection and mixing equipment will be decontaminated before and after each use. Decontamination will be accomplished in accordance with SOP 6, "Decontamination of Equipment Used to Sample Soil and Water".
6. All sample containers will be labeled immediately after sample acquisition.
7. All samples will remain in control of the field personnel at all times or be stored in a secured area. At the end of each day, samples will be either stored in a locked facility, delivered to the field XRF laboratory, or delivered to the designated project analytical laboratory under chain of custody as specified in SOP 4, "Sample Custody Procedures".

## 4.0 SAMPLE HANDLING AND ANALYSIS

All samples will be placed in the appropriate sample containers and labeled. Chain-of-custody forms will be completed for each sample and will accompany the samples to the appropriate field XRF or project analytical laboratory. Analyses required for each sample will be noted for each sample on the chain-of-custody forms. This requirement applies to samples that will be immediately shipped for analyses and to all samples that will be archived for potential future analyses. All archived samples will be stored separate from other samplesand will be listed on separate chain-of-custody forms.

Samples will be packed for shipment in a manner that prevents sample container breakage and secures the shipping container from opening during shipment. A custody seal will be placed on the outside of the sample shipping container prior to shipping and covered with clear tape to prevent tampering.

All XRF analyses will be conducted following SOP 23, "X-Ray Fluorescence On-Site Measurement". All ICP-AES analyses will follow analytical methods in accordance with EPA CLP protocols and will follow the CRDLs specified in the QAPP.

Sample handling and analysis will be in accordance SOP 5, "Packaging and Shipping of Environmental Sample Containers" and with procedures specified in the QAPP.

### 4.1 XRF Sample Preparation

Sample preparation will follow the procedures used for previous AOC sampling events. The samples will be homogenized, dried, and sieved to obtain the <250 µm size fraction. Following sieving, large samples will be split to obtain smaller aliquots for analysis. SOP-32 "Standard Operating Procedure for Field Laboratory Soil Sample Preparation", included in Attachment A, will be used for this preparation.

The required equipment for on-site sample preparation includes personal protection equipment and sample processing equipment. Personal protection equipment consists of lab gloves, safety goggles, and dusk masks. Sample processing equipment includes polypropylene sample cups, mylar film, plastic sampling spoons, drying trays, commercial grade microwave oven, handheld US Standard No. 60 sieves, a riffle splitter, decontamination brushes, and compressed air as appropriate.

### 4.2 XRF Analysis

The XRF analysis will be in accordance with SOP 23, modified from Golder Associates technical procedure "TP-2.2-13", "X-Ray Fluorescence On-Site Measurement." The SOP includes steps for laboratory setup and preparation of equipment for sample processing, instrument startup, energy checks, calibration checks, and blank material checks. Decontamination of non-dedicated equipment is explained, and methods for handling and archiving soil samples are presented.

The XRF instrument exposes the prepared samples to X-ray and gamma ray sources which cause fluorescence of energy shells within the elements of concern. The detector portion of the instrument receives the fluorescence, separates the energy from interferences, and provides individual element concentrations in the sample based upon the intensity of the fluorescence. The instrument planned for use on this project will likely be the NITON XLi 518 Model instrument. This is a field portable, single source exposure spectrophotometer device with on board calibration and storage capabilities. A Radio-isotope source of Am-241 is used in this instrument to provide exposure and fluorescing capabilities. An alternate instrument that will provide equivalent exposure energies may be used if necessary.

### 4.3 QA/QC Samples

QA/QC samples will be collected in accordance with SOP 3, "Field Quality Control Samples". For this project, QA/QC samples will include field duplicates (FDs) and decontamination rinsate blanks (DRB). The FD sample results will be used to evaluate laboratory precision, heterogeneity of the soil, and precision of field sampling techniques. DRB samples will be used to evaluate the potential for cross-contamination between samples due to inadequate decontamination of non-dedicated equipment.

FD samples will be collected at a frequency of once per 20 samples. DRB samples will be collected at the beginning of sample processing and once during the midpoint of sample processing.

For QA/QC (in accordance with the QAPP), a 5% subset of the XRF samples will be split and submitted for laboratory analysis for the presence copper using the methodology listed in Table 4-1 of the QAPP for soil/sediment samples.

## 5.0 SCHEDULE

Sample collection will occur at a given property only after the property owner has given approval, and will be performed in accordance with the schedule in the Access Agreement. Samples for XRF analysis will be analyzed on a daily basis, where practical. Samples requiring laboratory analyses will be forwarded to the analytical laboratory within one week after a sample is collected.

## 6.0 DATA VALIDATION

Data will be validated using the guidelines presented in QAPP and SOPs. Data validation is based on the EPA Functional Guidelines for Inorganic Analyses (EPA 2002) or applicable reference method requirements as appropriate. Data from previous investigations or other sources which will be used for decision making will also be reviewed for usability based on these criteria, if possible.

Original data generated in the field or by a laboratory will be reviewed by the Construction QA Manager or their designee and copied. Originals will be retained in the project file and working copies distributed to personnel designated by the Construction QA Manager for validating/verifying analytical data.

Validation/verification and data management activities will be organized by analytical fraction (i.e., metals). All hard copy or electronic deliverable data will be reviewed against chain-of-custody for verification of sample identification and analyses requested. Any incorrect data or discrepancies noted in the verification will be resolved with project management and/or the data generator. Any corrections to the original data will be noted on the batch log, and corrected data sheets or electronic deliverables will be issued if necessary. After the completion of data validation/verification, any qualifiers or other comments noted during the validation/verification process will be entered into the qualifier or comment section of the database as appropriate.

## 7.0 REFERENCES

EPA 2002, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540/R-01-008, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC.

Golder 2005, Work Plan for the Interim Remedial Action at the Hurley Soils Investigation Unit, prepared for Chino Mines Company by Golder Associates, Redmond, Washington, September 14, 2005.

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Singer DA. 1975. "Relative efficiencies of square and triangular grids in the search for elliptically shaped resource targets." *Journal of Research of the U.S. Geological Survey,* 3(2):163-167.

WDOE 1999, Integrated Final Cleanup Action Plan and Final Environmental Impact Statement for the Upland Area, Everett Smelter Site, Everett, Washington, Vol. 1, Washington Department of Ecology, November 19, 1999.

# ATTACHMENT A

# STANDARD OPERATING PROCEDURE # 32

# FIELD LABORATORY SOIL SAMPLE PREPARATION

# STANDARD OPERATING PROCEDURE # 32:

**Field Laboratory Soil Sample Preparation**

All soil samples will be processed at the field laboratory according to this procedure, which is based on the analytical laboratory sample preparation procedures. Soil is heterogeneous, and the preparation procedures will homogenize the sample and provide a representative aliquot for XRF and analytical laboratory analysis. The preparation procedures will also separate the soil sample into the <250 μm size fraction for analysis. One Ziploc bag of soil will be used for all samples. The procedure is as follows:

1. The bag of soil will be shaken and rolled to mix material that may have separated after sample collection.

2. The sample will be placed into dry, clean, non-metal pans; and air dried, or oven dried at 105 °C, for 24 hours. The drying pans must be placed in a location without wind or other disturbance. The drying pans need to be placed with ample room between each sample so that the disturbance of one pan does not contaminate another sample. Moisture content will not be determined.

3. All of the dried soil will be disaggregated by screening through a U.S. Standard No. 60 sieve (i.e., 250 μm). Clods, if any, will be broken by hand or crushed using a suitable mallet and protective covering cloth. The soil passing through the No. 60 sieve (i.e., the <250 μm fraction) will be labeled and processed as a sample for analysis. The >250 μm size fraction soil will <u>not</u> be analyzed.

7. The <250 μm size fraction soil will be placed in a clean Ziploc bag and shaken to ensure heterogeneity of the sample. The mixed sample will be split into two sub-samples. One sub-sample will be placed into a new polypropylene sample cup and covered with Mylar film to complete the sample preparation for XRF analysis. The XRF sample label will be written on a piece of masking tape and attached to the cup. The other split, consisting of at least 25 grams of material will be labeled and archived in a clean glass jar. The archive will be labeled with the sample id used for XRF analysis and the suffix "-ARCH." Any material left over after collecting the required volumes can be discarded.

8. The XRF samples will be analyzed following the protocols specified in the FSP. After the XRF analysis, the sample cup will be labeled with the analytical laboratory sample ID. The tape label, containing the XRF sample ID, will be removed from the cup. The samples will be listed on a chain of custody form and shipped to the analytical laboratory in coolers at $4^{o}C \pm 2^{o}C$.

9. Cross-contamination will be minimized by the following precautions: (1) the laboratory technician will wear a clean set of disposable polyethylene gloves for processing each sample; and (2) drying pans and sieves will be cleaned between samples as follows: (a) drying pans will be washed with detergent, rinsed with tap water, and given a final rinse with de-ionized water, and (b) sieves will be thoroughly brushed and then "blown off" with dry compressed air. (If any soil remains on the sieve after the compressed air cleansing, the sieve must be washed with soap and water and dried before reuse.)

10. Personal protection equipment will include safety glasses, NIOSH-95 dust masks, disposable lab gloves, and lab coats.